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## Analysis of farmers' willingness to participate in pasture grazing programs: Results from a discrete choice experiment with German dairy farmers

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### ABSTRACT

Over the last decades, the usage of pasture for grazing of dairy cows has decreased considerably. Pasture grazing programs initiated by dairy companies try to counteract this trend. The present paper investigates farmers' willingness to participate in such grazing programs. A special aim was to quantify the price premiums farmers require for program participation and to identify determinants influencing the premium level. The empirical analysis is based on a discrete choice experiment with 293 German dairy farmers. Models are estimated in terms of willingness to accept. It was found that farmers have no substantial preference for whether the pasture grazing program is financed by the food industry, a governmental scheme, or the dairy company. However, an extension of the annual or daily grazing period results in a decreasing willingness of farmers to participate in a pasture grazing program. In addition, farmers decline the option of a feeding standard prescribing the use of only green fodder when offered an alternative program that merely reduces the amount of concentrated feed or maize silage in the diet. Farmers' with an aversion toward program participation have a significant higher price demand for fulfilling the program requirements. Furthermore, the required price premiums increase with growing milk yields and a greater number of cows kept on the farm. However, if the availability of pasture is high, farmers are more likely to participate. The estimated price premiums and factors influencing farmers' willingness to participate found by this study should be considered by dairies and policymakers to gain insights into the design of possible pasture grazing programs from the perspective of farmers. Thereby, paying price premiums to farmers may increase the attractiveness of pasture

grazing, which could finally result in an extended usage of pasture grazing.

**Key words:** pasture grazing program, farmers' preferences, discrete choice experiment, willingness to accept

### INTRODUCTION

The dairy industry has changed considerably in terms of production methods, products, and processing over the last decades. This change is characterized by the concentration of milk production on fewer, but larger, farms and a substantially increased annual milk production per cow (Gillespie et al., 2009; Reijs et al., 2013). As part of this development, cows have less pasture access (Burow et al., 2013; Reijs et al., 2013). However, grazing is associated with improved health and welfare for dairy cows (Burow et al., 2013) and satisfies the increasing demand of consumers for products with high nutritional value and sensory quality (Ellis et al., 2009; Slots et al., 2009). This added value results in consumers' willingness to pay (**WTP**) for pasture-grazed milk (Ellis et al., 2009; Wolf et al., 2011; Weinrich et al., 2014).

For farmers, this condition provides the opportunity to receive a higher milk price by producing value-added milk. This is of particular interest because the high volatility of fluid milk prices and feed costs as well as the growing gap in the farm-retail price asymmetry affect the economic viability of dairy farms (Government Accountability Office, 2009). Considering both the advantage of pasture-based dairy farming as a low-cost strategy (Tozer et al., 2003) and the opportunity to benefit from value-added milk, pasture grazing might thereby be an approach for farmers to remain competitive. One possibility to generate a monetary surplus from pasture-grazed milk is participation in a pasture grazing program as offered by some dairy companies in the Netherlands, the United States, and Denmark, for example (Reijs et al., 2013). These dairies have already established milk from pasture as a premium product

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and are thus able to realize higher prices and pay farmers an incentive for producing pasture-grazed milk.

Previous studies (White et al., 2002; Gillespie and Nehring, 2014) have often compared the characteristics of pasture-based dairy farms and confinement systems without focusing on the farmers' willingness to participate in a pasture grazing program. Therefore, the objective of this paper is to assess the willingness of dairy farmers to participate in a pasture grazing program. In particular, we aim to analyze to what extent specific program requirements and monetary incentives influence the willingness of farmers to participate. In addition, we investigate how the farmers' willingness to participate is affected by the farm structure and farmers' characteristics. Considering the estimated price premiums and factors influencing farmers' willingness to participate is useful for dairies and policymakers to gain insights into the design of possible pasture grazing programs from the perspective of farmers.

The study seeks to understand farmers' perceptions by conducting a discrete choice experiment (DCE) with dairy farmers in Germany. Farmers' preferences and willingness to accept (WTA) participation in a pasture grazing program are analyzed using a mixed logit model (MLM) in WTA space. With this approach, we are building on previous studies in the fields of agricultural and environmental research estimating farmers' WTA (e.g., Christensen et al., 2011; Schulz et al., 2014; Schreiner and Latacz-Lohmann, 2015). All of these studies estimate the WTA in preference space, which, unfortunately, often results in unrealistic and invalid distributions for WTA (Scarpa et al., 2008; Hensher and Greene, 2011). However, models in WTA space have been found to produce more realistic estimations (Train and Weeks, 2005). Therefore, the model estimation in WTA space is an important feature in our study. As an additional novelty, we allow for correlations of the random attributes, which results in a more realistic estimation of farmers' preferences for participation in a pasture grazing program. In previous studies, correlations were often not regarded (with exception of Balcombe et al., 2009, 2010; Balogh et al., 2016).

## MATERIALS AND METHODS

### Data Collection

For the empirical analysis, primary data were collected from German dairy farmers. An anonymous online survey was developed and available for participants from January to March 2016. Farmers were invited to participate in the survey through a mailing list of the University of Göttingen, Germany, a reference to the

study in an agricultural magazine and social media channels. The surveys of 293 farmers were included in the evaluation, whereas 37 surveys could not be used because they lacked important data for the econometric analysis. The farmers needed 19 min on average to complete the experiment.

The questionnaire was structured as follows. First, participating farmers were asked to provide general operating data related to their farms. Second, the DCE was conducted. Next, questions were raised to identify the farmers' perceptions of different aspects of pasture grazing. Finally, socio-demographic data were collected.

### The Discrete Choice Experiment

The DCE are underlying the stated preference approach, which allows for conclusions to be drawn from previously nonarticulated preferences about real choice decisions (Louviere et al., 2000). Thereby, the attribute-based measure of respondents' preferences is possible through a scenario of hypothetical decision-making situations (List et al., 2006). In a DCE, participants are confronted with several choice sets consisting of different alternatives and are asked to select one of the given alternatives. Each presented alternative is characterized by pre-defined attributes and their associated levels. By systematically varying the attributes with their levels the respective influence on the selection decision can be determined (Louviere et al., 2000).

To examine the preferences of German farmers for participation in pasture grazing programs, utilization of a DCE is advisable because data about real pasture grazing programs is insufficient for an econometric analysis; thus, an experimental design is necessary to identify preferences for certain program arrangements. In doing so, initial predictions can be made on how pasture grazing programs should be designed to suit practical applications.

### Attributes and Levels in the Discrete Choice Experiment

The DCE used in this investigation presented the following decision situation to the participating farmers: the farmers had to choose 1 of 2 pasture grazing programs or could decide not to participate in either (opt-out). The opt-out alternative was included because program participation is voluntary. A forced choice could lead to inaccuracy and inconsistency with demand theory (Hanley et al., 2001). Each decision situation (choice set) provided 2 different and mutually exclusive program alternatives. The programs were neutrally referred to as "pasture grazing program A" and "pasture grazing program B," so as not to reveal

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